Bates Cochlear Implant Project

Change Is Coming!

"For years, Musicians have been told that the ear acts as a Fourier analyzer. This quarter-truth has increased the distrust of perceptive musicians regarding scientists."

— W. Dixon Ward (1970)
(https://en.wikipedia.org/wiki/Ohm%27s_acoustic_law)

That same half-truth became a cochlear implant, and its abilities were compromised. But there is hope: The Bates Cochlear Implant.

During the Cold War, electronics engineer John K. Bates, Jr. was assigned to design a passive radar defense system possessing the ear's abilities. However, he discovered that the Fourier-based model of the ear was not suitable for his electronic radar ears. As a result, he decided to start from scratch and developed a new model to provide his electronic ears with the necessary capabilities.

John's model was groundbreaking as it completely disregarded tradition. Rather than using complex mathematics, he employed third-grade arithmetic. Instead of focusing on the frequency domain, which views the world through mathematical lenses, he embraced the time domain – the domain of vibrating strings, audio speakers, changing voltages, and the perception of sound by the ear.

John's design was first classified and hidden from view; it reemerged in a time of change—electronic components containing embedded formulas replaced the discrete elements of John's electronic radar ear's era. The mathematically intensive model of the ear received a new life, and John's model was pushed aside and eventually discarded—but John didn't forget.

Approaching retirement, John built a laboratory in his basement and began investigating acoustic uses for his radar ear. Using his electronic intelligence experience, John started extracting the building blocks of speech from sounds—phonemes—and followed that with manipulating phonic elements. He began deconstructing heavily accented speech, removing the phonics associated with accents, and reconstructing speech free of accents.

However, the introduction of another electronic ear, the cochlear implant, changed John's life. The implant was based on the ear model John rejected, and he knew it would contain unsolvable problems, and it did. The quality of voices was so poor that many wearers resorted to lipreading.

And music was heard as a muddy rumble. So, John decided to build an alternative implant, a better implant.

In 1999, John presented an improved and tested cochlear implant design to the industry. His implant wasn't sound-centric; it was phoneme-centric—conversation-centric. Superior to current models, speech was understandable, and music quality was only limited by the wearer's cochlea damage. However, John was an outsider, and his implant was too different. It went against accepted implant design principles and was unwelcome, so they ignored it. Yet John continued his research.

The following two decades were a creative period. John created a model of the ear's cochlea that reproduced every known ear's ability and demonstrated an ability others only discussed. John's model explains a still unsolved mystery - how does the cochlea's basilar membrane function?

The core of John's implant began being used in industrial vibration analysis and music applications. A video on BatesCochlear.com demonstrates the deconstruction of Adele's voice into 92 channels (six Octaves), and a Windows application using the core of John's implant was created to assist singers in identifying and correcting vocal faults and received excellent reviews.

"The most significant characteristic of PASSAGGIO is the visible manifestation of singing sound properties in a convincing mathematical way. You may control almost everything, from the exact pitch of the voice and the shaky voice (wrong vibrato frequency) from the annoying "voce caprile" ("He-goat voice" with high frequency) to the unacceptable "ballare la voce" ("dancing voice" with low frequency and big pitch intervals) up to realize the differentiation of simple legato, tenuto, portando, portato and glissando. The students can easy understand how to control their music phrasing avoiding exaggerations, merely because they can observe what they sing."

- Zachos Terzakis, Opera Tenor, Vocal Teacher, Athens, Greece

"I have used Passagio in my studio to visually show my students whether they are singing on pitch. Once they realize that the center of the space or line equals the center of the pitch, it's easy for them to see their own accuracy and train their ear as well. The accuracy of the program is incredible. I highly recommend it."

- Mark Kent Vocal Teacher, High Point, North Carolina

On July 26, 2022, John passed. Afterward, as I had used the core of John's implant in industrial applications, his family gave me sixty-one notebooks and five terabytes of disk files—the only record of thirty-five years of his cochlear implant research. They want their father's work to have a purpose. I needed help.

A small group of volunteers and I have created the Bates Cochlear Implant Project to prevent the loss of John's research. We are developing a simulation of the Bates cochlear implant using the software commonly used by the cochlear implant industry. Subsequently, we will provide them with a thoroughly tested implant design in a language they understand. Through social media, we will encourage them to give it a fair and unbiased review.

There is a lot to do: We need to scan and digitize 8,000 notebook pages and organize five terabytes of disk files. More importantly, we need a specialist in this new language, which volunteers cannot afford. We need your help.

As a thank you for your donations, we are developing an iPhone version of the Windows vocal coach application. Once completed later this year, we will provide it to all donors who contribute $25 or more. We anticipate that the app will be offered through a subscription, and its value will exceed $25.

For donations, visit our GoFundMe page https://gofund.me/460dbc61

For more information about the Bates Cochlear Implant Project, visit BatesCochlear.com.